1 **Appendix S3 - Online supporting information for "Statistical Design and Analysis for Plant**

2 **Cover Studies with Multiple Sources of Observation Errors"**

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4 ***R scripts and Model code for conducting simulations and study design investigations***

5   Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS).

6 Although the software has been subjected to rigorous review, the USGS reserves the right to update

7 the software as needed pursuant to further analysis and review. No warranty, expressed or implied,

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9 material nor shall the fact of release constitute any such warranty. Furthermore, the software is

10 released on condition that neither the USGS nor the U.S. Government shall be held liable for any

11 damages resulting from its authorized or unauthorized use.

12

13   All simulations for this paper were conducted using R (version 3.3.1; R Core Team 2016) and

14 we provide the associated scripts. We fit models using Stan (Carpenter et al. 2016) and running

15 our scripts also requires the `rstan` package (version 2.12.1; Stan Development Team 2016). We

16 refer users to the Stan website (mc-stan.org) for documentation on correctly setting up Stan and

17 the `rstan` package. We also provide the JAGS (Plummer 2003) model code for our hierarchical

18 zero-augmented beta with errors (ZABE) model in this appendix.

19   List of files:

20   1. simulation_functions.R

21   2. simulation_runs.R

22   3. model_zab.stan

23   4. model_zabe.stan

24   5. model_zabe.jags

25   6. power_functions.R

26   7. power_tests.R

27   8. model_zabe2.stan

28   Files 1-4 are associated with the section 'Simulation-based Comparison of Statistical Models

29 for Plant Cover Datasets' in the paper. File 5 is the JAGS model equivalent of the Stan model

30 code (file 4) for our hierarchical ZABE model used in the simulations. Files 6-8 were used to

31 conduct the 'Survey Design Requirement Investigation' of our paper. File 2 contains the script

32 needed to run the simulations comparing the different approaches evaluated in the paper and relies

33 on sourcing the other files for this section (1, 3, and 4). Similarly, file 7 contains the script to run

34 the study design simulations we conducted and sources files 6 and 8. Each of the R files contains

35 additional comments throughout.

36 **References**

37 Carpenter, B., A. Gelman, M. Hoffman, D. Lee, B. Goodrich, M. Betancourt, M. A. Brubaker,

38   J. Guo, P. Li, and A. Riddell (2016). "Stan: A probabilistic programming language". *Journal*

39   *of Statistical Software*.

40 Plummer, M. (2003). "JAGS: A program for analysis of Bayesian graphical models using Gibbs

41   sampling". *Proceedings of the 3rd International Workshop on Distributed Statistical*

42   *Computing (DSC 2003)*. Ed. by K. Hornik, F. Leisch, and A. Zeileis. Vienna, Austria,

43   pp. 1–10. URL: https://www.r-project.org/conferences/DSC-2003/Proceedings/.

44 R Core Team (2016). *R: A Language and Environment for Statistical Computing*. R Foundation

45   for Statistical Computing. Vienna, Austria. URL: https://www.R-project.org/.

46 Stan Development Team (2016). *RStan: the R interface to Stan*. URL: http://mc-stan.org.